

WHAT IS CLAIMED IS:

1. A material classifier for classifying a liquid-solid mixture containing solid material to be separated, comprising:
 - a first tank for receiving the liquid-solid mixture; and
 - a first wheel angularly mounted at least partially within the first tank to rotate about a first wheel axis tilted at an angle relative to a horizontal reference, the first wheel having a plurality of spaced apart radially extending scoops about a periphery thereof for scooping up solid material from within the first tank and subsequently discharging the scooped solid material outside of the first tank during rotation of the first wheel.
2. The material classifier of claim 1 wherein the first tank includes a side wall located adjacent to and substantially conforming to a downwardly oriented first side of the first wheel for impeding scooped solid material from discharging from the scoops while rotating inside the first tank, the side wall having an upper edge portion over which the scoops discharge scooped solid material from the first side of the first wheel when rotated higher than the upper edge portion.
3. The material classifier of claim 2 wherein the side wall is substantially planar, and substantially perpendicular to the first wheel axis.
4. The material classifier of claim 2 wherein the tilt of the first wheel axis relative to the horizontal reference is greater than zero degrees and equal to or less than fifty degrees.
5. The material classifier of claim 4 wherein the tilt of the first wheel axis relative to the horizontal reference is greater than 30 degrees.
6. The material classifier of claim 1 wherein the first wheel includes an inner hub from which the scoops extend radially, the scoops each including a scoop wall terminating in an outer scoop edge, the scoop walls being substantially open sided at the first side of the first wheel.

7. The material classifier of claim 6 wherein the outer scoop edges of at least some of the scoop walls are substantially parallel to the first wheel axis.
8. The material classifier of claim 6 wherein the outer scoop edges of at least some of the scoop walls are angled relative to the first wheel axis.
9. The material classifier of claim 8 wherein the angled outer scoop edges are angled to be substantially parallel to a predetermined fill level for the liquid-solid mixture in the tank when the angled outer scoop edges are located at the predetermined fill level.
10. The material classifier of claim 6 wherein at least some of the scoops have scoop walls that taper from the first side of the first wheel to a second side thereof.
11. The material classifier of claim 6 wherein the inner hub includes a substantially cylindrical wall from which the scoops extend, at least some of the scoops having a width greater than that of the cylindrical wall.
12. The material classifier of claim 1 wherein at least one section of scoops are connected together as a unit removable from the first wheel.
13. The material classifier as claimed in claim 6, wherein the scoop wall of at least some of the scoops defines a concave region which opens in the direction of rotation of the first wheel.
14. The material classifier as claimed in claim 6, wherein the scoop wall of at least some of the scoops defines a cavity or hollow which opens in the direction of rotation of the first wheel.
15. The material classifier as claimed in claim 6, wherein the first tank further includes a bottom wall that is adjacent to a lower end of the first wheel and is substantially perpendicular to the side wall.
16. The material classifier of claim 1 further including:
a second tank connected to the first tank for receiving some of the liquid-solid mixture from the first tank; and

a second wheel angularly mounted at least partially within the second tank to rotate about a further wheel axis tilted at an angle relative to the horizontal reference, the further wheel having a plurality of spaced apart radially extending scoops about a periphery thereof for scooping up solid material from within the second tank and subsequently discharging the scooped solid material outside of the second tank during rotation of the further wheel.

17. The material classifier of claim 16 including independently controllable drives for the first wheel and second wheel for rotating the first wheel and second wheel at different speeds relative to each other , and a variable gate between the first and second tanks for controlling respective liquid-solid mixture levels therein.

18. The material classifier of claim 16 wherein the first wheel axis and second wheel axis are tilted at the same angle.

19. The material classifier of claim 16 further including:

a third tank connected to the second tank for receiving some of the liquid-solid mixture from the second tank;

a third wheel angularly mounted at least partially within the third tank to rotate about a third wheel axis tilted at an angle relative to the horizontal reference, the third wheel having a plurality of spaced apart radially extending scoops about a periphery thereof for scooping up solid material from within the third tank and subsequently discharging the scooped solid material outside of the third tank during rotation of the third wheel;

independently controllable drives for each of the wheels for rotating the wheels at separately controllable speeds; and

variable gates between the first and second tanks and the second and third tanks for controlling the flow of liquid-solid mixture therebetween.

20. The material classifier of claim 16, wherein the first and second wheels rotate in opposite directions.

21. The material classifier of claim 16, wherein the first and second wheels rotate in an upstream direction.
22. The material classifier of claim 16, wherein the first and second wheels rotate in a downstream direction.
23. The material classifier of claim 16 including a frame on which the first tank and second tank are mounted, the frame having transport wheels at least one end thereof.
24. The material classifier of claim 1, wherein the first tank has a feed hopper at a first end thereof for feeding the liquid-solid mixture into the tank, and an exit gate at an opposite second facing the first end, the first wheel being offset to one side of a flow-path through the first tank from the feed hopper at the first end to the exit gate at the second end.
25. A material classifier for classifying a liquid-solid mixture containing solid material to be separated, comprising:
 - a tank for receiving the liquid-solid mixture, the tank having a plurality of sidewalls including a tilt sidewall positioned at an angle relative to the vertical;
 - a wheel rotatably and angularly mounted for rotation within the tank, wherein the wheel is mounted within the tank at a tilt angle relative to the vertical and which corresponds to the angle of the tilt sidewall, the wheel being mounted adjacent to the tilt sidewall;
 - a plurality of elongate scoops attached about a periphery of the wheel for scooping solid material which has settled on a bottom of the tank; and
 - a drive mechanism for rotating the wheel within the tank.
26. The material classifier as claimed in claim 25, further comprising an angularly mounted discharge chute attached to the tilt sidewall at an upper limit thereof.
27. A method of classifying material, comprising:

providing a scoop wheel having a plurality of scoops located about a periphery thereof and mounted to rotate a scoop wheel axis that is tilted relative to a horizontal reference, the scoop wheel having a downwardly oriented first side and being located in a tank having an upwardly extending wall adjacent the first side of the scoop wheel, the wall having an upper limit above which the scoops extend during rotation;

adding a liquid-solid mixture to the tank to a predetermined fill level;

rotating the scoop wheel to scoop settled solid material from a bottom of the tank;

rotating the scoop wheel further to discharge the scooped material from the first side of the scoop wheel when the scooped material is above the upper limit.

28. A material classifier for classifying a liquid-solid mixture having various grades of solid material therein, comprising:

(a) a first classifier stage for removing a first predetermined grade of solid material from the liquid-solid mixture, including:

a first tank for receiving the liquid-solid mixture;

a first wheel rotatably mounted at least partially within the first tank, the first wheel having a plurality of spaced apart radially extending scoops about a periphery thereof for scooping up solid material from within the first tank and subsequently discharging the scooped solid material outside of the first tank during rotation of the first wheel;

(b) a second classifier stage for removing a second predetermined grade of solid material from the liquid-solid mixture, including:

a second tank connected to the first tank for receiving some of the liquid-solid mixture from the first tank; and

a second wheel rotatably mounted at least partially within the second tank, the second wheel having a plurality of spaced apart radially extending scoops about a periphery thereof for scooping up solid material from within

the second tank and subsequently discharging the scooped solid material outside of the second tank during rotation of the second wheel; and

(c) independently controllable drives for the first wheel and the second wheel for rotating the first wheel and second wheel at different speeds relative to each other, and a variable gate between the first and second tanks for controlling respective liquid-solid mixture levels therein.